Docket No.: 09634/000L276-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:
Yukiko Inoue et al.

Patent No.: 7,031,385

Issued: April 18, 2006

For: METHOD AND APPARATUS FOR DETECTING SCENE CHANGE OF A COMPRESSED MOVING - PICTURE, AND PROGRAM RECORDING MEDIUM THEREFOR

REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 37 CFR 1.323 AND PATENT OFFICE MISTAKE (37 CFR 1.32)

Attention: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Upon reviewing the above-identified patent, Patentee noted several Patent Office errors which should be corrected.

The following errors were not in the application as filed by applicants:

On the Face of the Patent:

Col. 2, Foreign Patent Documents, Line 1, after "3/1995" insert -- H04N 9/77 --.

Col. 2, Foreign Patent Documents, Line 2, after "5/1995" insert -- G06F 17/30 --.

Col. 2, Foreign Patent Documents, Line 3, after "12/1997" insert -- HO4N 5/92--.

Col. 2, Foreign Patent Documents, Line 4, after "12/1998" insert -- H04N 5/91 --.

In the Specification:

Column 1, Line 34, after "color" delete ",".

Column 2, Line 49, after "are" delete ",".

Column 6, Line 20, after "whereas" delete ":".

Column 7, Line 62, delete "S)." and insert --s).--.

Column 8, Line 58, after "picture" delete "-in" and insert -- in --.

Column 9, Line 33, after "t+2" delete ",".

In the Claims:

Column 14, Line 12 (claim 7), delete "judging step of" before "judging an".

Column 14, Line 14 (claim 7), delete "extracting step of" before "extracting a".

Enclosed please find copies of the PTO form PTO-1449 submitted with an Information Disclosure Statement filed on August 26, 2002, pages 2, 4, 11, 15, 16, & 18 of the specification as filed and page 5 of an Amendment filed November 1, 2005. The PTO-1449 demonstrates that the applicants provided the Patent Office with the classes and subclasses of the foreign patent documents listed on the face of the patent. The enclosed pages of the specification as filed and of the November 1, 2005 Amendment demonstrates that the above errors were introduced by the Patent Office, and were not in the application as filed.

The following errors were found in the application as filed by applicant. The errors now sought to be corrected are inadvertent typographical errors, the correction of which does not involve new matter or require reexamination.

Furthermore, this Certificate of Correction places the issued claims 10 and 11, which correspond to application claims 14 and 15, into their original language, as filed, which was found to be allowable by the Examiner in the first Office Action on the merits and each subsequent Office Action thereafter. Application claims 14 and 15 were not amended during prosecution, although their language was inadvertently changed due to a clerical transcription error on the part of the Applicants.

On the Face of the Patent:

Col. 2, Attorney, Agent, or Firm, Line 1, after "Darby & Darby" insert -- P.C.--.

In the Figures:

Sheet 3 of 10, FIG. 5, Line 8, delete "STRUCURE" and insert -- STRUCTURE --.

In the Specification:

Column 2, Line 52, delete "judgement" and insert -- judgment --.

In the Claims:

Column 14, Line 53 (claim 10), delete "A" and insert - - A method for detecting a scene change in - -.

Column 14, Line 54 (claim 10), delete "for detecting a scene change in" and insert - - containing - -.

Column 14, Line 55 (claim 10), after "picture," delete "the program".

Column 14, Line 56 (claim 10), delete "an image structure judging step of" before "judging".

Column 14, Line 58 (claim 10), delete "a feature quantity extracting step of" before "extracting".

Column 14, Line 63 (claim 10), delete "a storage area for" before "storing".

Column 14, Line 65 (claim 10), delete "an extracted data comparing step of" before "comparing".

Column 15, Line 1 (claim 10), delete "a scene change judging step of" before "judging".

Column 15, Lines 1-2 (claim 10), delete "by the use of" and insert - - when - -.

Column 15, Lines 2-3 (claim 10), delete "calculated by the extracted data comparing step" and insert - - exceeds a threshold value - -.

Column 15, Line 4 (claim 11), delete "A" and insert - - A method for operating a - -.

Column 15, Line 7 (claim 11), delete "a feature quantity extracting step of" before "extracting".

Column 15, Line 11 (claim 11), delete "a storage area for" before "storing".

Column 15, Line 13 (claim 11), delete "an extracted data comparing step of" before "comparing".

Column 16, Lines 1-2 (claim 11), delete "a scene change judging step of judging a scene change by the use of the quantity" and insert - - judging a scene change based on an amount - -.

Column 16, Line 10 (claim 12), delete "lenght" and insert -- length --.

Transmitted herewith is a proposed Certificate of Correction effecting such amendment. Patentee respectfully solicits the granting of the requested Certificate of Correction.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100. Payment of $100.00 is enclosed herewith.

Dated: June 23, 2006

Respectfully submitted,

By _____

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FORM PTO-1449 U.S. DEPARTMENT OF COMMERCE PATENT & TRADEMARK OFFICE

(REV. 7-80)

LIST OF REFERENCES CITED BY APPLICANT

(Use Several Sheets if Necessary)

DOCKET NO.:	9634/0L276US0	SERIAL NO:	09/677,802
APPLICANT:	Yukiko INOUE	FILING DATE:	October 2, 2000
		CONFIRMATION NO:	

U.S. PATENT DOCUMENTS

*EXAMINER INITIALS	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE

FOREIGN PATENT DOCUMENTS

*EXAMINER INITIALS	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	1. 07059108	03/95	Japan	H04N	9/77		Abstract Only
	2. 07121555	05/95	Japan	G06F	17/30		Abstract Only
	3. 09322120	12/97	Japan	H04N	5/92		Abstract Only
	4. 10327387	12/98	Japan	H04N	5/91		Abstract Only

OTHER REFERENCES
(INCLUDING AUTHOR, TITLE DATE, PERTINENT PAGES, ETC.)

*EXAMINER INITIALS

EXAMINER: _____ DATE CONSIDERED: 02/23/04

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

brightness (Y) and color difference (Cb, Cr). These data and are encoded in macro block units of 16 x 16 pixels.

In encoding each of the macro blocks, motion compensation prediction in which motion prediction is performed from a reference image is selected or, alternatively, intra-encoding in which encoding is performed only by data for encoding is selected.

Motion compensation prediction is a method in which the encoding percentage rises when the time correlation between frames is high. A prediction error signal is derived from a difference between the data of the macro block to be encoded and the data of the macro block obtained by motion prediction from the reference image and compressed information in time and in space. In motion compensation prediction, the prediction error signal is converted into a space frequency domain by DCT for each block of 8 x 8 pixels.

On the other hand, intra-encoding is a method in which block data itself to be encoded is divided into each block of 8 x 8 pixels, and DCT encoding is simply performed for each block.

The unit of encoding in MPEG2 is an interlaced image that is also an object thereof. In addition a frame structure and a field structure each constitute an image-encoding unit.

In the frame structure, two interlaced fields, an odd field and an even field, are subjected to encoding. In the field structure, one field of either the odd field or the even field is subjected to encoding.

In this specification, an image encoded in the frame structure is referred to as "frame structure image", and an image encoded in the field structure is referred to as "field structure image".

constructed of only the signal of one field, and therefore the field DCT is always performed.

Based on the above description, a conventional scene change detection technique uses feature quantities of:

(1) histogram of image colors,

(2) data size of a compressed moving-picture,

(3) block data difference between images of two frames at the same position, etc.

(1) Using the histogram of image colors, colors used for an image of one frame are indicated in the histogram in that frame or in a region where one frame is divided. With the histogram as the feature quantity of the frame, a degree of similarity is calculated in comparison with the feature quantities of frame images before and after the frame (see Japanese Unexamined Patent Publication No. Hei-7-59108, for example).

(2) Using the data size of a compressed moving-picture, the data sizes of adjacent frames are compared by use of the tendency that the compressibility is low at a scene change part, and, when the difference exceeds a predetermined threshold, the judgement that it is a scene change is shown (see Japanese Unexamined Patent Publication No. Hei-7-121555, for example).

In the techniques of (1) and (2), it is only in each frame that the scene change can be detected. Therefore, if the scene change occurs between an odd field and an even field in one frame (i.e., between two fields), the scene change cannot be accurately detected.

Referring now to Fig. 1, a bit stream, encoded according to MPEG2, is inputted as an inputted compressed moving-picture to the scene change detection apparatus. Information about the position of a scene change detected in the bit stream is output as a detection result from the scene change detection apparatus. As described in "Background of the Invention" of the specification, the encoding system of an inputted compressed moving-picture, the unit of encoding (frame/field structure), and DCT have each various forms, and, without being limited to a specific one, a plurality of forms can exist together on the time base.

Especially, no problem occurs even when field structure images and frame structure images exist alternately on the time base. The foregoing respects are adaptable, without changes, to the other embodiments that will be described later.

The inputted compressed moving-picture is first inputted to an image structure judging portion 1. The image structure judging portion 1 judges whether the image being input at the present is a field structure image or a frame structure image with reference to information about a specific region of the bit stream. Thereafter, the judgment result and the content of the bit stream are output to a feature quantity extracting portion 2 in the next step.

Referring now to Figs. 5 and 6, feature quantity extracting portion 2 compares images on the left side of the figure, which are older on the time base, with those on the right side, which are new. A t(th) image ("t" indicates a numeral, and "th" is a suffix indicating an ordinal number) is designated as "image t". In this example, image t-2 to image t+1, and image t+4 to image t+5 are field structure images, whereas image t+2 and image t+3 are frame structure images. That is, images t+1 to t+2 and images t+3 to t+4 have structural changes.

variation R (t, s) and a second threshold for the second quantity of variation Q (t, s).

When the extracted data comparing portion 3 makes a comparison, the scene change judging portion 4 refers to the comparison result information stored in the second data memory 7. If the comparison produces a value which exceeds the threshold input from the scene change judgment data input portion 5, the scene change judging portion 4 judges that a scene change has occurred at this position, and thereafter outputs image information (i.e., position in a bit stream), such as a frame number relating to the comparison result information. If the comparison does not produce a value which exceeds the threshold, the scene change judging portion 4 may omit an output, or it may output a detection result to the effect that the threshold was not exceeded.

Referring now to Fig. 2, when an inputted compressed moving-picture reaches the image structure judging portion 1, the judging portion 1 judges whether the present image is a frame structure image or a field structure image (Step 1). If the present image is a frame structure image, the feature quantity extracting portion 2 extracts a value that uses data for two upper and lower blocks of the image in the vertical direction as a feature quantity and stores it in the first data memory 6 (Step 2). If the present image is a field structure image, the feature quantity extracting portion 2 extracts a value that uses data for one block as a feature quantity and stores it in the first data memory 6 (Step 3). In other words, the frame structure image uses double data in the vertical direction in comparison to the field structure image.

In Step 4, the extracted data comparing portion 3 compares the present feature quantity with the previous feature quantity, and stores comparison result information in the second data memory 7. Thereafter, in Step 5, the scene change

judging portion 4 compares the comparison result information with a threshold that is inputted from the data input portion 5. If the comparison result is judged to represent a scene change, the scene change judging portion 4 outputs the position where the scene change has occurred as a detection result.

In this embodiment, the block data Dt for one block is used as the feature quantity dt in the field structure image, and a mean value of the block data Dtu and Dtb for two blocks in the vertical direction is used as the feature quantity dt in the frame structure image. However, if the comparison level of the data between the field structure image and the frame structure image is equal, other techniques can be used. For example, a comparison can be made between a feature quantity dt in which the block data for one block of the field structure image is doubled (dt=2 x Dt) and another feature quantity dt in which the block data for two upper and lower blocks in the vertical direction are added (dt=Dtu+Dtb).

Additionally, in this embodiment, the data extracted in the field structure image one unit per block. The data extracted in the frame structure image is one unit per two blocks. However, if the data extracted from the frame structure image is double data in the vertical direction that exists at the position corresponding to the data extracted in the field structure image, a scene change can be detected in the same way. In other words, when the data of the field structure image N block is extracted as a feature quantity, all that is required is to extract double data from 2 x N blocks in the vertical direction of a corresponding position from the frame structure image as a feature quantity.

As a result, scene changes can be uniformly detected from a compressed moving-picture in which frame structure images and field structure images exist together. Scene changes can be detected without giving special consideration even when frame DCT or field DCT is used in the frame structure image. Since this

block coordinates (x, 2(y)) and block coordinates (x, 2(y+1)) in image t+2, because image t+2 is a frame structure image.

For example, if the data obtained from block coordinates (x, y) in image t+1 is defined as A, data obtained from block coordinates (x, 2(y)) and block coordinates (x, 2(y+1)) is defined as B and C, respectively, and the absolute value of a difference between data A and a mean value of data B and C is made a quantity of variation. By calculating this quantity of variation in the entire image, the quantity of variation of two images is obtained.

In this embodiment, a mean value for two blocks in the vertical direction is used as the data of the frame structure image. However, this may be merely performed by addition. In this case, all that is required is to normalize data in such a way that, for example, data of a corresponding field structure image is doubled. Specifically, an appropriate way is to define the absolute value of a difference between a double value of data A and a sum of data B and C as a quantity of variation.

The remainder of functions are the same as in the first embodiment in Fig. 1.

(Third Embodiment)

Referring now to Figs. 9 and 10, a scene change detection apparatus according to a third embodiment of the present invention, when compared to the first embodiment in Fig. 1, adds a field DCT encoding block number counting portion 8 and a third data memory 9. If a judgment result obtained by the image structure judging portion 1 is a frame structure image, the field DCT encoding block number counting portion 8 judges whether the encoding uses frame DCT or field DCT, and counts the number of macro blocks (the number of blocks is also acceptable) where the field DCT encoding in one field is performed. And, the

8. (Currently Amended) The apparatus for detecting a scene change in a compressed moving-picture as set forth in Claim 4, wherein the judging unit is further operable to use a threshold as a criterion of a scene change; and

the threshold includes a maximum quantity of variation of an image ~~a threshold determined on the basis of a maximum quantity of variation of an image is included in thresholds that the scene change judging portion uses as a criterion of a scene change~~.

9. (Cancelled)

10. (Currently Amended) A method of detecting a scene change in a compressed moving-picture comprising the steps of:

~~an image structure judging step of~~ judging an image structure of an inputted compressed moving-picture;

~~a feature quantity extracting step of~~ extracting a feature quantity based on top and bottom double data in vertical direction of an image with respect to a field structure image when a judgment result of the image structure judging step is a frame structure image;

~~a storage area for~~ storing data extracted by the feature quantity extracting step in a storage area;

~~an extracted data comparing step of~~ comparing the extracted block data and calculating a quantity of variation of a picture; and

~~a scene change judging step of~~ judging a scene change by the use of the quantity of variation calculated by the extracted data comparing step.

comparing the extracted data and calculating a quantity of variation of a picture; and

judging a scene change when the quantity of variation exceeds a threshold value.

15. A method for operating a recording medium that computer-readably records a program for detecting a scene change in a compressed moving-picture, the program comprising:

extracting a feature quantity based on block data for one block independently of an image structure of an inputted compressed moving-picture;

storing block data extracted by the feature quantity extracting step;

comparing a feature quantity by the use of double block data in vertical direction of an image with respect to a field structure image when an image from which a feature quantity has been extracted is a frame structure image; and

judging a scene change based on an amount of variation calculated by the extracted data comparing step.

16. A method for operating a recording medium that computer-readably records a program for detecting a scene change in a compressed moving-picture, the program comprising:

counting a number of blocks that have undergone field DCT encoding when an image is a frame structure image; and

comparing the number of blocks with a threshold to detect a scene change that exists between fields.

17. A method for operating a recording medium that computer-readably records a program for detecting a scene change in a compressed moving-picture, the program comprising:

judging a scene change; and

~~a scene change interval retrieving step of retrieving scene changes that exist at a start point and an end point of a specified particular interval among scene changes detected by the scene change judging step~~

detecting, from the plurality of pairs of scene changes, a pair of scene changes having an interval length equal to a predefined interval length.

14. (Original) A recording medium that computer-readably records a program for detecting a scene change in a compressed moving-picture, the program comprising:

an image structure judging step of judging an image structure of an inputted compressed moving-picture;

a feature quantity extracting step of extracting a feature quantity based on top and bottom double data in vertical direction of an image with respect to a field structure image when a judgment result of the image structure judging step is a frame structure image;

a storage area for storing data extracted by the feature quantity extracting step;

an extracted data comparing step of comparing the extracted data and calculating a quantity of variation of a picture; and

a scene change judging step of judging a scene change by the use of the quantity of variation calculated by the extracted data comparing step.

15. (Original) A recording medium that computer-readably records a program for detecting a scene change in a compressed moving-picture, the program comprising:

a feature quantity extracting step of extracting a feature quantity based on block data for one block independently of an image structure of an inputted compressed moving-picture;

a storage area for storing block data extracted by the feature quantity extracting step;

an extracted data comparing step of comparing a feature quantity by the use of double block data in vertical direction of an image with respect to a field structure image when an image from which a feature quantity has been extracted is a frame structure image; and

a scene change judging step of judging a scene change by the use of the quantity of variation calculated by the extracted data comparing step.

16. (Cancelled)

17. (Currently Amended) A recording medium that computer-readably records a program for detecting a scene change in a compressed moving-picture, the program comprising:

a scene change judging step of judging a scene change;

a measuring step of selecting a plurality of pairs of the scene changes from the plurality of scene changes and measuring an interval lenght for each of the plurality of pairs; and

~~a scene change interval retrieving step of retrieving scene changes that exist at a start point and an end point of a specified particular interval among scene changes detected by the scene change judging step~~

extracting a feature quantity based on block data for one block independently of an image structure of an inputted compressed moving-picture;

storing said block data;

comparing a feature quantity by the use of double block data in a vertical direction of an image with respect to a field structure image when an image from which a feature quantity has been extracted is a frame structure image; and

judging a scene change using said quantity of variation.

12. A method of detecting a scene change in a compressed moving-picture comprising:

counting a number of blocks that have undergone field DCT encoding when an image is a frame structure image; and

comparing the number of blocks with a threshold and judging a scene change that exists between fields.

13. A method of detecting a scene change in a compressed moving-picture comprising:

detecting a scene change; and

retrieving scene changes that exist only at a start point and an end point of a specified particular interval.

14. A method for detecting a scene change in recording medium that computer-readably records a program containing a compressed moving-picture, comprising:

judging an image structure of an inputted compressed moving-picture;

extracting a feature quantity based on top and bottom double data in vertical direction of an image with respect to a field structure image when a judgment result of the image structure judging step is a frame structure image;

storing data extracted by the feature quantity extracting step;

PTO/SB/44 (04-05)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,031,385
APPLICATION NO. : 09/677,802
ISSUE DATE : April 18, 2006
INVENTOR(S) : Yukiko Inoue et al.

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Col. 2, Attorney, Agent, or Firm, Line 1, after "Darby & Darby" insert -- P.C.--.

In the Figures:

Sheet 3 of 10, FIG. 5, Line 8, delete "STRUCURE" and insert -- STRUCTURE --.

In the Specification:

Column 1, Line 34, after "color" delete ",".

MAILING ADDRESS OF SENDER (Please do not use customer number below):
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Column 2, Line 49, after "are" delete ",".

Column 2, Line 52, delete "judgement" and insert -- judgment --.

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Column 9, Line 33, after "t+2" delete ",".

In the Claims:

Column 14, Line 12 (claim 7), delete "judging step of" before "judging an".

Column 14, Line 14 (claim 7), delete "extracting step of" before "extracting a".

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Column 15, Line 4 (claim 11), delete "A" and insert - - A method for operating a - -.

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